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Date 12 / 10 / 2001

Serial Number of Application 09 / 921,334

Name Linda Sholl (SPRE)

Art Unit TC 3700 Phone 308

Building (circle one) CP2 CPK1 Floor 5 Room # D24

Number of Results returned (Minimum 50/ Maximum 300) 100

Keywords to emphasize


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L1: Entry 6 of 13

File: USPT

Apr 11, 2000

US-PAT-NO: 6047556

DOCUMENT-IDENTIFIER: US 6047556 A

TITLE: Pulsed flow for capacity control

DATE-ISSUED: April 11, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lifson; Alexander	Manlius	NY		

## ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Carrier Corporation	Syracuse	NY			02

APPL-NO: 8/ 986447

DATE FILED: December 8, 1997

INT-CL: [7] F25B 3/00

US-CL-ISSUED: 62/196.2; 62/196.4, 62/217, 62/513, 251/129.05

US-CL-CURRENT: 62/196.2; 251/129.05, 62/196.4, 62/217, 62/513

FIELD-OF-SEARCH: 62/196.2-196.4, 62/217, 62/513, 251/129.05

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

☐ **Search Selected**☐ **Search ALL**

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<input type="checkbox"/> <u>4838037</u>	June 1989	Wood	251/129.05 X
<input type="checkbox"/> <u>4854130</u>	August 1989	Naruse et al.	62/513 X
<input type="checkbox"/> <u>5063750</u>	November 1991	Englund	62/196.3
<input type="checkbox"/> <u>5226472</u>	July 1993	Benevelli et al.	62/217 X
<input type="checkbox"/> <u>5634350</u>	June 1997	De Medio	62/217
<input type="checkbox"/> <u>5816055</u>	October 1998	Ohman	62/196.3 X

ART-UNIT: 374

PRIMARY-EXAMINER: Bennett; Henry

ASSISTANT-EXAMINER: Norman; Marc

ABSTRACT:

Step control in capacity modulation of a refrigeration or air conditioning circuit is achieved by rapidly cycling a solenoid valve in the suction line, economizer circuit or in a bypass with the percent of "open" time for the valve regulating the rate of flow therethrough. A common port in the compressor is used for economizer flow and for bypass.

3 Claims, 1 Drawing figures  
Exemplary Claim Number: 1  
Number of Drawing Sheets: 1

#### BRIEF SUMMARY:

#### BACKGROUND OF THE INVENTION

In a closed air conditioning or refrigeration system there are a number of methods of unloading that can be employed. Commonly assigned U.S. Pat. No. 4,938,666 discloses unloading one cylinder of a bank by gas bypass and unloading an entire bank by suction cutoff. Commonly assigned U.S. Pat. No. 4,938,029 discloses the unloading of an entire stage of a compressor and the use of an economizer. Commonly assigned U.S. Pat. No. 4,878,818 discloses the use of a valved common port to provide communication with suction for unloading or with discharge for V.sub.i control, where V.sub.i is the discharge pressure to suction pressure ratio. In employing these various methods, the valve structure is normally fully open, fully closed, or the degree of valve opening is modulated so as to remain at a certain fixed position. One problem associated with these arrangements is that capacity can only be controlled in steps or expensive motor driven modulation valves must be employed to fix the valve opening at a certain position for capacity control.

#### SUMMARY OF THE INVENTION

Gradual compressor capacity can be achieved by rapidly cycling solenoid valve(s) between fully open and fully closed positions. The cycling solenoid valve(s) can be located in the compressor suction line, the compressor economizer line and/or the compressor bypass line which connects the economizer line to the suction line. The percentage of time that a valve is open determines the degree of modulation being achieved. However, because the cycling time is so much shorter than the response time of the system, it is as though the valve(s) are partially opened rather than being cycled between their open and closed positions.

It is an object of this invention to provide continuous capacity control.

It is another object of this invention to provide step control in capacity modulation.

It is a further object of this invention to provide a less expensive alternative to the use of variable speed compressors.

It is another object of this invention to provide a less expensive alternative to a modulation valve. These objects, and others as will become apparent hereinafter, are accomplished by the present invention.

Basically, gradual or step control in capacity modulation of a refrigeration circuit is achieved by rapidly cycling a solenoid valve in the compressor suction line and/or the compressor economizer line and/or bypass line.

#### DRAWING DESCRIPTION:

#### BRIEF DESCRIPTION OF THE DRAWING

For a fuller understanding of the present invention, reference should now be made to the following detailed description thereof taken in conjunction with the accompanying drawing wherein.

The FIGURE is a schematic representation of an economized refrigeration or air conditioning system employing the present invention.

Solomon, Terrance

# 56415

From: Sholl, Linda  
Sent: Saturday, December 08, 2001 5:19 PM  
To: STIC-EIC3700  
Subject: litigation and plus search for 6047556

Please do a litigation and plus search for ~~6047556~~

It is for reissue ~~09/921334~~

Thanks,  
Linda Sholl  
Special Programs Examiner  
TC3700  
PK1-5D24  
703-308-1288

DEC 10 2001

6 047 556

QUESTEL ORBIT

Files searched:

Databases : LGST, CRXX, PAST, LITA

?us6047556/pn

Term not in index/PN-LITA : US6047556

LGST	1
CRXX	1
PAST	1
LITA	0

1/3 LGST (1/1) - (C) LEGSTAT  
PN - US 6047556 [US6047556]  
AP - US 986447/97 19971208 [1997US-0986447]  
DT - US-P  
ACT - 19971208 US/AE-A  
APPLICATION DATA (PATENT)  
{US 986447/97 19971208 [1997US-0986447]]  
- 20000411 US/A  
PATENT  
- 20011023 US/RF  
REISSUE APPLICATION FILED  
20010803  
UP - 2001-44

2/3 CRXX (1/1) - (C) CLAIMS/RRX  
AN - 3305475  
PN - 6,047,556 A 20000411 [US6047556]  
PA - Carrier Corp  
PT - M (Mechanical)  
ACT - 20010803 REISSUE REQUESTED  
ISSUE DATE OF O.G.: 20011023  
REISSUE REQUEST NUMBER: 09/921334  
EXAMINATION GROUP RESPONSIBLE FOR REISSUEPROCESS: 3744

Reissue Patent Number:

UP - 2001-43  
UACT- 2001-10-23

3/3 PAST (1/1) - (C) PAST  
AN - 200143-001809  
PN - 6047556 A [US6047556]  
DT - A (UTILITY)  
OG - 2001-10-23  
CO - REA  
ACT - REISSUE APPLICATION FILED  
SH - REISSUE APPLICATION FILED

**INPADOC SEARCH RESULTS FOR US PATENT 6,047,556**  
**December 11, 2001**

1/39/1

DIALOG(R) File 345:Inpadoc/Fam.& Legal Stat

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15148276

Basic Patent (No,Kind,Date): EP 921364 A2 19990609 <No. of Patents: 007>

Patent Family:

Patent No	Kind	Date	Applic No	Kind	Date	
BR 9805207	A	19991123	BR 98U5207	A	19981207	
CN 1235265	A	19991117	CN 98122457	A	19981112	
EP 921364	A2	19990609	EP 98630071	A	19981120	(BASIC)
EP 921364	A3	20000614	EP 98630071	A	19981120	
JP 11270916	A2	19991005	JP 98347687	A	19981208	
JP 2986469	B2	19991206	JP 98347687	A	19981208	
US 6047556	A	20000411	US 986447	A	19971208	

Priority Data (No,Kind,Date):

US 986447 A 19971208

PATENT FAMILY:

BRAZIL (BR)

Patent (No,Kind,Date): BR 9805207 A 19991123  
DISPOSITIVO PARA OBTEN ER CONTROLE DE CAPACIDADE EM UM SISTEMA.  
(Portuguese)

Patent Assignee: CARRIER CORP (US)

Author (Inventor): LIFSON ALEXANDER

Priority (No,Kind,Date): US 986447 A 19971208

Applic (No,Kind,Date): BR 98U5207 A 19981207

IPC: \* F25B-049/02

Derwent WPI Acc No: \* G 99-315470

Language of Document: Portuguese

CHINA (CN)

Patent (No,Kind,Date): CN 1235265 A 19991117

PULSED FLOW FOR CAPACITY CONTROL (English)

Patent Assignee: CARRIER CORP (US)

Author (Inventor): LIFSON ALEXANDER (US)

Priority (No,Kind,Date): US 986447 A 19971208

Applic (No,Kind,Date): CN 98122457 A 19981112

IPC: \* F25B-049/00

Derwent WPI Acc No: \* G 99-315470

Language of Document: Chinese

EUROPEAN PATENT OFFICE (EP)

Patent (No,Kind,Date): EP 921364 A2 19990609

PULSED FLOW FOR CAPACITY CONTROL (English; French; German)

Patent Assignee: CARRIER CORP (US)

Author (Inventor): LIFSON ALEXANDER (US)

Priority (No,Kind,Date): US 986447 A 19971208

Applic (No,Kind,Date): EP 98630071 A 19981120

Designated States: (National) ES; FR; IT; NL

IPC: \* F25B-049/02; F25B-041/04

Derwent WPI Acc No: \* G 99-315470; G 99-315470

Language of Document: English

Patent (No,Kind,Date): EP 921364 A3 20000614

PULSED FLOW FOR CAPACITY CONTROL (English; French; German)

Patent Assignee: CARRIER CORP (US)  
 Author (Inventor): LIFSON ALEXANDER (US)  
 Priority (No,Kind,Date): US 986447 A 19971208  
 Applic (No,Kind,Date): EP 98630071 A 19981120  
 Designated States: (National) AT; BE; CH; CY; DE; DK; ES; FI; FR; GB;  
 GR; IE; IT; LI; LU; MC; NL; PT; SE  
 IPC: \* F25B-049/02; F25B-041/04; F04B-049/24  
 Derwent WPI Acc No: \* G 99-315470  
 Language of Document: English

EUROPEAN PATENT OFFICE (EP)

Legal Status (No,Type,Date,Code,Text):

EP 921364	P	19971208	EP AA	PRIORITY (PATENT APPLICATION) (PRIORITAET (PATENTANMELDUNG))
				US 986447 A 19971208
EP 921364	P	19981120	EP AE	EP-APPLICATION (EUROPAEISCHE ANMELDUNG)
				EP 98630071 A 19981120
EP 921364	P	19990609	EP AK	DESIGNATED CONTRACTING STATES IN AN APPLICATION WITHOUT SEARCH REPORT: (IN EINER ANMELDUNG OHNE RECHERCHENBERICHT BENANNTEN VERTRAGSSTAATEN)
				ES FR IT NL
EP 921364	P	19990609	EP AX	ERSTRECKUNG DES EUROPAEISCHEN PATENTS AUF (ZAHLUNG VON BENENNUNGSGEBUHREN)
				AL;LT;LV;MK;RO;SI
EP 921364	P	19990609	EP A2	PUBLICATION OF APPLICATION WITHOUT SEARCH REPORT (VEROFFENTLICHUNG DER ANMELDUNG OHNE RECHERCHENBERICHT)
EP 921364	P	20000614	EP AK	DESIGNATED CONTRACTING STATES IN A SEARCH REPORT: (IN EINEM RECHERCHENBERICHT BENANNTEN VERTRAGSSTAATEN)
				AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
EP 921364	P	20000614	EP AX	ERSTRECKUNG DES EUROPAEISCHEN PATENTS AUF (ZAHLUNG VON BENENNUNGSGEBUHREN)
				AL;LT;LV;MK;RO;SI
EP 921364	P	20000614	EP A3	SEPARATE PUBLICATION OF THE SEARCH REPORT (ART. 93) (GESONDERTE VEROEFFENTLICHUNG DES RECHERCHENBERICHTS (ART. 93))
EP 921364	P	20000614	EP RIC1	CLASSIFICATION (CORRECTION) (KLASSIFIKATION (KORR.))
				7F 25B 49/02 A, 7F 25B 41/04 B, 7F 04B 49/24 B
EP 921364	P	20010131	EP 17P	REQUEST FOR EXAMINATION FILED (PRUEFUNGSANTRAG GESTELLT)
				20001208
EP 921364	P	20010221	EP AKX	PAYMENT OF DESIGNATION FEES (ZAHLUNG VON BENENNUNGSGEBUHREN)
				ES FR IT NL
EP 921364	P	20010329	DE 8566/REG	DESIGNATED COUNTRY DE NOT LONGER VALID (VERTRAGSSTAAT DE NICHT MEHR)

BENANNT)

JAPAN (JP)

Patent (No,Kind,Date): JP 11270916 A2 19991005  
SYSTEM HAVING PULSATING REFRIGERANT FLOW FOR CAPACITY CONTROL (English)  
Patent Assignee: CARRIER CORP  
Author (Inventor): LIFSON ALEXANDER  
Priority (No,Kind,Date): US 986447 A 19971208  
Applic (No,Kind,Date): JP 98347687 A 19981208  
IPC: \* F25B-001/10  
Derwent WPI Acc No: \* G 99-315470  
Language of Document: Japanese  
Patent (No,Kind,Date): JP 2986469 B2 19991206  
Patent Assignee: CARRIER CORP  
Author (Inventor): AREKUSANDAA RIFUSON  
Priority (No,Kind,Date): US 986447 A 19971208  
Applic (No,Kind,Date): JP 98347687 A 19981208  
IPC: \* F25B-001/10  
Language of Document: Japanese

UNITED STATES OF AMERICA (US)

Patent (No,Kind,Date): US 6047556 A 20000411  
PULSED FLOW FOR CAPACITY CONTROL (English)  
Patent Assignee: CARRIER CORP (US)  
Author (Inventor): LIFSON ALEXANDER (US)  
Priority (No,Kind,Date): US 986447 A 19971208  
Applic (No,Kind,Date): US 986447 A 19971208  
National Class: \* 062196200; 062196400; 062217000; 062513000;  
251129050  
IPC: \* F25B-003/00  
Derwent WPI Acc No: \* G 99-315470  
Language of Document: English

UNITED STATES OF AMERICA (US)

Legal Status (No,Type,Date,Code,Text):  
US 6047556 P 19971208 US AE APPLICATION DATA (PATENT)  
(APPL. DATA (PATENT))  
US 986447 A 19971208  
US 6047556 P 20000411 US A PATENT  
US 6047556 P 20011023 US RF REISSUE APPLICATION FILED  
(REISSUE APPL. FILED)  
20010803



LEXIS NEXIS

Files searched: Patent library; all patent files

PATNO IS 6047556

Your search request has found 1 PATENT through Level 1.

LEVEL 1 - 1 OF 1 PATENT

6,047,556

<=2> GET 1st DRAWING SHEET OF 1

Apr. 11, 2000

Pulsed flow for capacity control

REISSUE: Reissue Application filed Aug. 3, 2001 (O.G. Oct. 23, 2001) Ex. Gp.:  
3744; Re. S.N. 09/921,334

CORE TERMS: valve, compressor, economizer, solenoid, suction, refrigerant,  
bypass, rapidly, 18-1, modulation...

File searched: CASES

6,047,556 OR 6047556

Your search request has found no CASES.

File searched: JOURNALS

Your search request has found no ITEMS.